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(72) Inventor Kun-Nan Lo	(58) Field of search A6H A6D Selected US specifications from IPC sub-class A63D
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(54) Cue with carbon fibre shell and polyurethane foam core

(57) The cue includes a striking tip 30, a shaft 10 including a shell 11 of carbon fiber filled with a core 12 made of polyurethane foam in the intermediate portion thereof to leave a space in the front end portion thereof, a solid front connector 20 of carbon fiber adhered to the striking tip 30 and including a stem 22 at the rear end thereof for being inserted into the front end portion of the shell 11 to contact the core 12. The butt end of the cue is closed by a pastic rear connector 50 and a rubber cushion 60.

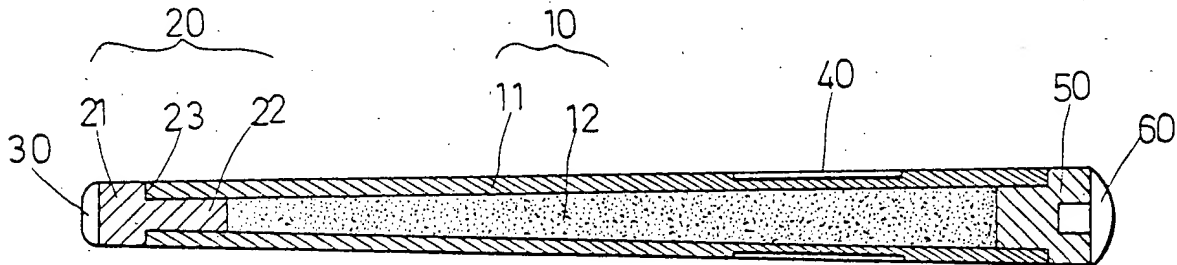


FIG3

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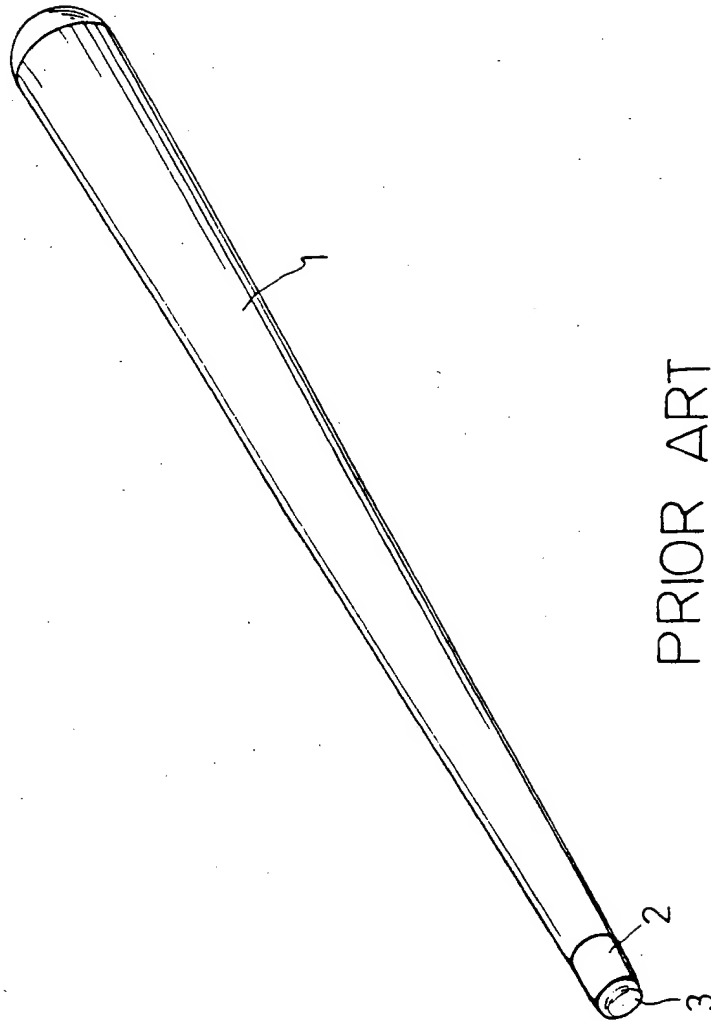
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PRIOR ART
FIG 1

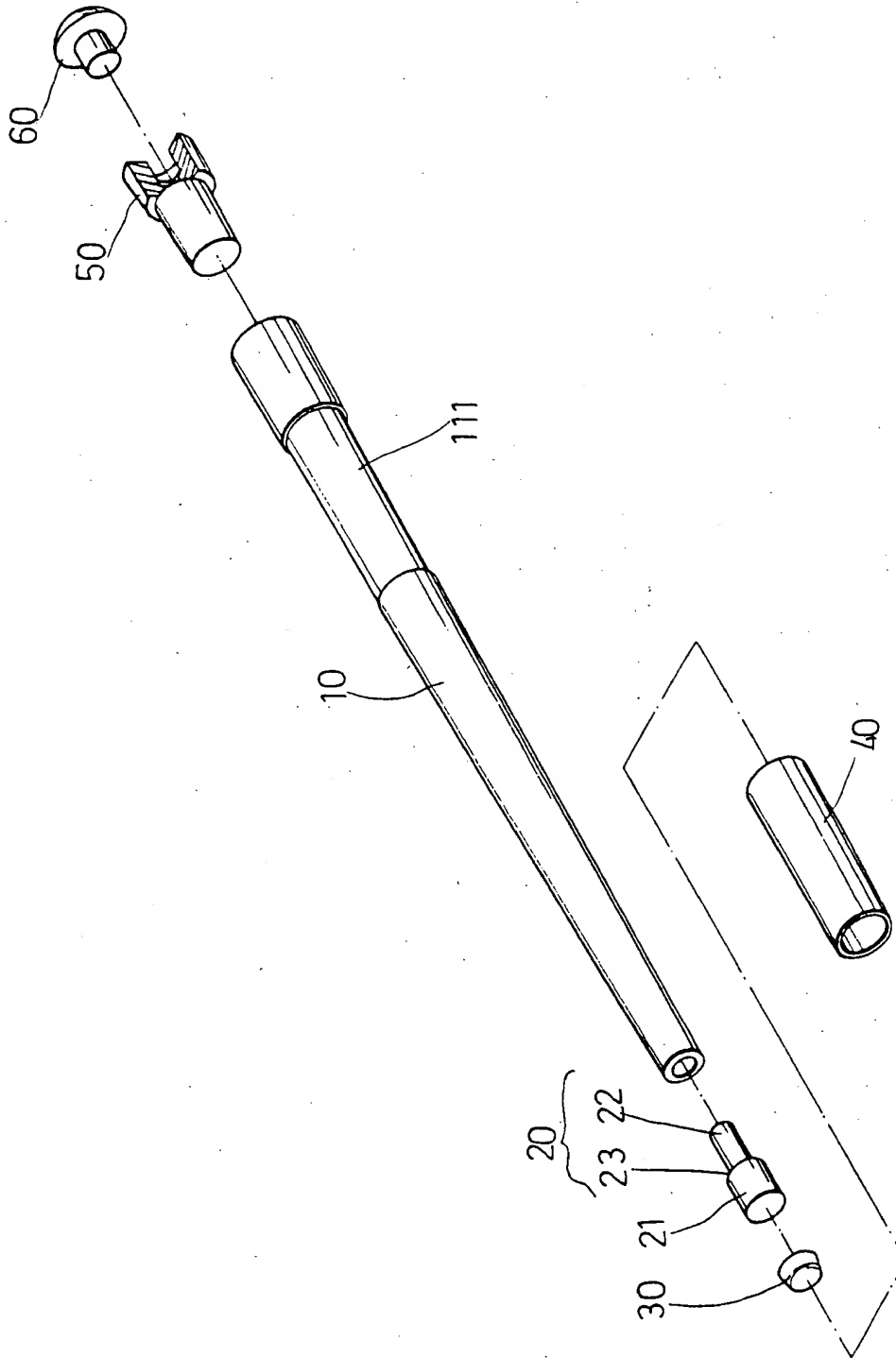


FIG. 2

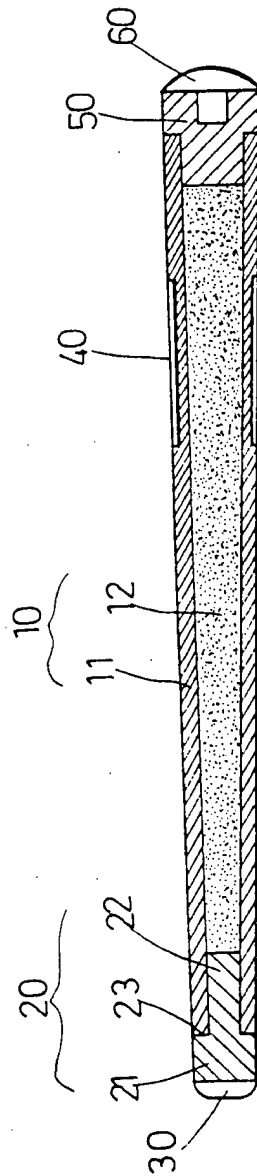


FIG.3

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IMPROVED CUE

The invention relates to a cue, particularly to a durable, utility one that does not risk deformation resulting from differences in temperature and humidity in the environment.

Generally, the quality of a cue is important for a player playing billiards. In addition to the perfection of the striking tip, the straightness of the cue is required. The shafts of the known cues are commonly made of wood, so deformation resulting from differences in temperature and humidity in the environment inevitably incurs. This deformation easily causes curvature of the shaft. When a wooden cue is used for a long time, as a result of the strokes of the cue against a cue ball the degree of curvature is continuously increased so that the cue becomes useless. Furthermore, when numerous cues on order are exported by sea, due to significant changes in temperature and humidity, the delivered goods may become unqualified although the goods first were qualified. This is not practical from a utility and economic standpoint.

Referring to Fig. 1, commonly, a known cue includes a shaft 1, a sleeve 2, and a striking tip 3. The sleeve 2 is made of plastic or metal for preventing the front end portion of the shaft 1 from breaking when the tip 3 strikes a cue ball. It is understood that

common woods have poor delivery of force from the shaft to the striking tip. Although woods of high class possess dense, solid characteristics so as to have a better delivery of force, they are expensive. They also may be sealed in a case with a flannel lining to minimize the deformation resulting from differences in temperature and humidity. However, this is not only more expensive but also inconvenient. Recently, cues of compound material such as fiber reinforced plastic have been developed for preventing the shaft from deformation, but it is heavy, and has not led to an improvement in practical use for striking a cue ball.

It is therefore an object of the invention to provide a utility cue which imparts an effective, instant stroke on a cue ball and which delivers a uniform force from the shaft to the striking tip.

It is another object of the invention to provide a solid cue without risking deformation resulting from differences in temperature and humidity in the environment.

It is still another object of the invention to provide a cue which is convenient to be gripped and which imparts a comfortable sense of touch.

According to the invention, the improved cue includes a striking tip attached at the frontmost end of the cue; a shaft, including a forwardly converging shell of a circular section made of carbon fiber and

filled with a core made of polyurethane foam in the intermediate portion thereof to leave a space in the front end portion of the shaft; and a solid front connector, made of carbon fiber, including a cylindrical body adhered to the striking tip at the front end thereof, and a cylindrical stem projecting rearwardly from the body for being inserted into the front end portion of the shell to contact the core. Optionally, further provided are an annular groove in the outer surface of the rear end portion of the shell, and a rubber ring sleeving on the groove for being conveniently gripped and for absorbing the shock of the shaft.

15 The invention will be described in more detail, by way of example, with reference to the accompanying drawings in which:

Fig. 2 is an exploded view of an improved cue according to the invention; and

Fig. 3 is a section of an improved cue of Fig. 2.

20 Referring to Figs. 2 and 3, an improved cue according to the invention includes a shaft 10, including a forwardly converging shell 11 made of carbon fiber and filled with a core 12 made of polyurethane foam in the intermediate portion thereof to leave a cylindrical space in each end of the shaft 10, and an annular groove 111 in the outer surface of the rear end portion thereof; a solid front connector

20, including a cylindrical body 21 and a stem 22 projecting rearwardly from the center of the rear surface of the body 21 to form a shoulder 23 between the body 21 and the stem 22 for being inserted in the front end portion of the shaft 10; a striking tip 30 adhered to the front surface of the front connector 20; a rubber ring 40 heated to sleeve on the groove 111; a plastic rear connector 50 connected to the shaft 10 in a manner the same as the front connector 20; and a rubber cushion 60, attached to the rear connector 50 in a manner the same as the connections between the shaft 10 and the connectors 20, 50.

The depth of the groove 111 is approximate to $1/3$ of the thickness of the wall of the shell 11.

It is understood that the connections of the front connector 20, the shaft 10, the rear connector 50, and the cushion 60 are performed by engagement of a stem and a well-matched hole. This assembly is easy to effect. Preferably, the mutually connected outer surfaces are on the level so as to be attractive.

Since the solid front connector 20 and the hollow shell 11 of the shaft 10 are made of carbon fiber, the deformation resulting from differences in temperature and humidity in the environment is minimized due to the fact that the coefficient of heat expansion of carbon fiber is approximate to zero. Naturally, the rigidity of the cue is simulataneously increased.

It should be noted that the core 12 made of polyurethane foam is capable of absorbing shock. Thus, the polyurethane foam filling in the shell 11 of the shaft 10 can save the energy of the player on playing billiards.

It is optimal that the fibers of the carbon fiber of the front connector 20 is densely arranged in a direction parallel axially to the shaft 10 so as to achieve rapid, uniform delivery of force.

Further, sleeving of the rubber ring 40 on the shaft 10 has the following advantages: (1) Convenient gripping; (2) Good sense of touch; and (3) Absorption of shock of the shaft. Alternatively, the ring 40 may be made of cork or other resilient material.

Still further, the stem 22 of the front connector 20 preferably contacts the core 12. As a result of the occurrence of the stem 22 and the the shoulder 23 of the front connector 20, the force will be delivered from the striking tip 30 to respective shell 11 and core 12.

With the invention thus explained, it is apparent that the additional improvements provide obvious advantages for practical use.

CLAIMS:

1. An improved cue of the type having a front portion with a resilient striking tip mounted at the frontmost end thereof, an intermediate portion connected to the rear end of said front portion and including a forwardly converging shaft of a circular section, and a rear portion connected to the rear end of said intermediate portion, characterized in that said shaft includes a forwardly converging shell made of carbon fiber and filled with a core made of polyurethane foam in the intermediate portion thereof so as to leave a space in each end portion of said shaft for respectively sleeving on said front and rear portions.
2. An improved cue as claimed in Claim 1, wherein said front portion includes a solid front connector made of carbon fiber for connecting said striking tip to the front end of said shaft so as to deliver force from said shaft to said striking tip.
3. An improved cue as claimed in Claim 2, wherein said front connector includes a cylindrical body adhered to said striking tip at the front end thereof and being of an outer diameter the same as that of the front end of said hollow shaft, and a cylindrical stem projecting rearwardly from said body of said front connector and being of an outer diameter slightly less than the inner diameter of the front end of said shaft for inserting into the front end portion of said shell to

contact said core.

4. An improved cue as claimed in Claim 1, wherein said rear portion includes a rubber cushion, and a plastic rear connector for connecting said cushion to the rear end of said shaft.

5. An improved cue as claimed in Claim 4, wherein said rear connector includes a cylindrical body connected to said cushion by a tongue and groove engagement and being of an outer diameter the same as that of the rear end of said hollow shaft, and a cylindrical stem projecting forwardly from said body and being of an outer diameter slightly less than the inner diameter of the rear end of said hollow shaft for inserting in the rear end portion of said shaft.

6. An improved cue as claimed in Claim 1, further comprising a rubber ring, and wherein said shaft has an annular groove in the rear portion thereof for receiving said rubber ring in said groove so as to be gripped comfortably and to absorb the shock of said shaft when said striking tip is striking.

7. An improved cue substantially as hereinbefore described with reference to Figs. 2 and 3 of the accompanying drawings.